

## ACKNOWLEDGEMENTS.

Field work in 1980 was funded by Australian Biological Resources Study grant No. 81/2170 and in 1987 by the Faculty of Biological Sciences, University of NSW.

## REFERENCES

- SMITH-WHITE A.R. 1984. A genecological study of *Sporobolus virginicus* (L.) Kunth. Ph.D Thesis. University of N.S.W.
- SMITH-WHITE A.R. 1988. *Sporobolus virginicus* (L.) Kunth in coastal Australia: the reproductive behaviour and the distribution of morphological types and chromosome races. *Aust. J. Bot.* 36 (1) 23-39.

## AN ANSWER TO THE PUZZLE OF THE TRACKS

By GARY J. MORGAN, Western Australian Museum and  
JOHN D. BLYTH, Department of Conservation and  
Land Management, Perth.

In an earlier article in the Western Australian Naturalist (Morgan and Blyth, 1987), we posed a question as to the cause of numerous unusual impressions and tracks on the intertidal flats of the Murray River delta.

We now have an answer. Dr Ernest Hodgkin of the Environmental Protection Authority directed our attention to a photograph on page 57 of his report on the Blackwood River Estuary (Hodgkin, 1978). Illustrated are the puddling tracks of silver gulls, *Larus novaehollandiae*, which mirror exactly the tracks found by us on the Murray River. Dr Hodgkin had his attention drawn to the puddling of gulls by Mr Jim Lane, leader of the Waterbird and Wetlands Research Group with the Department of Conservation and Land Management, a long time bird watcher on the wetlands around Perth. This revelation concurs with the gull hypothesis in our previous note. Subsequently, one of us (J.B.) has observed further gull puddling activity in the Perth environs resulting in tracks as illustrated.

Puddling by silver gulls has been previously observed in the eastern states of Australia. In a short note, Collins and Collins (1976) mentioned a 'double-shuffle' action of gulls puddling for food items in shallow water near Beeac, western Victoria. The above authors also noted the behaviour in wading birds (e.g. egrets) but it is also displayed by non-waders such as the magpie-lark, *Grallina cyanoleuca* (Prendergast, 1983; Hobbs, 1986; H. Aston, pers. comm.). A similar 'foot-pattering' has been recorded for the flame robin, *Petroica phoenicea*, in non-aquatic habitats (Reynolds, 1976).

## ACKNOWLEDGEMENTS

We thank Ms Helen Aston for supplying much of the information on puddling behaviour noted above and Dr Ernest Hodgkin for responding to our request for opinions on the tracking puzzle.

## REFERENCES

- COLLINS, T. AND COLLINS, A. 1976. Puddling action of silver gulls. *The Bird Observer* 535: 46.
- HOBBS, J.N. 1986. Gyrating as a feeding method of the Australian magpie-lark. *Aust. Bird Watcher* 11(7): 238-239.
- HODGKIN, E.P. 1978. An environmental study of the Blackwood River estuary Western Australia 1974-75. *Department of Conservation and Environment Report No. 1*: 1-78.
- MORGAN, G.J. AND BLYTH, J.D. 1987. On the tracks of a natural puzzle. *West. Aust. Nat.* 17(1): 1-3.
- PRENDERGAST, H.D.V. 1983. 'Foot-puddling' by Australian magpie-lark. *Canb. Bird Notes* 8(4): 106-108.
- REYNOLDS, E.G. 1976. The 'foot-pattering' feeding habit of the flame robin. *The Bird Observer* 532: 21.

## BREEDING SYSTEMS OF THE WESTERN AUSTRALIAN FLORA III : AIZOACEAE

by G.J. KEIGHERY<sup>1</sup>

Department Conservation and Land Management,  
W.A. Wildlife Research Centre,  
P.O. Box 51, Wanneroo, W.A., 6065

### ABSTRACT

Information on the breeding systems of 22 species of the family Aizoaceae is given. Cleistogamy is recorded for *Sarcozona praecox* and *Mesembryanthemum crystallinum*. Self fertility is common. Inbreeding species have been noted in the genera *Gunniopsis*, *Tetragonia* and *Trianthema*.

### INTRODUCTION

The family Aizoaceae in Western Australia consists of 46 species (of which 7 are naturalized aliens), many of them being widely distributed throughout the state (Keighery, 1984). Very little information is available on the biology of component species, except for the brief notes on *Carpobrotus* by Black (1969) and the largely taxonomic study on *Gunniopsis* by Chinnock (1983).

### MATERIALS AND METHODS

Plants were cultivated, for breeding system studies, from wild collected seed or cuttings. In general those large succulent genera were represented in the study by only a few individuals, but were able to be supplemented by cut material kept in water to observe flower behaviour. During flowering, plants were isolated from insects, and observed. Fortunately in the Aizoaceae anther dehiscence and stigma maturation are readily observable and distinguishable in morphology. If flowers were capable of autogamy (placing its own pollen onto the receptive stigma), and fruits subsequently formed contained seeds, no artificial self pollinations were undertaken. In those cases where autogamy did not occur, artificial self pollinations were made.

Voucher specimens are deposited in Perth and Kings Park.